WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

- MARITIME RESEARCH (Special Report)
- ARMY R & D
- MISSILE RANGE DATA
- RESEARCH CHECKLIST
- PUBLICATION CHECKLIST

Vol. IV, No. 24 August 29, 1960

* MARITIME RESEARCH AND DEVELOPMENT

A special committee of the National Academy of Sciences recommends that the U. S. Maritime Administration spend not less than $10 to $12 million annually over the next ten years for research and development programs. This would be in addition to sums for nuclear experimentation and ship prototypes. A large share of this proposed spending would be with private industry and educational organizations. Here is a summary of major R&D opportunities that may arise in this program:

✓ Development of an integrated bridge display similar to those being developed for aircraft and submarines.

✓ Development of improved weather routing procedures, through increased understanding of sea conditions on ship speed and improved transmittal procedures.

✓ Study of the problems of harbor surveillance and coordination in order to determine whether this would be practical in U. S. ports, particularly under adverse weather conditions.

✓ Study bridge-to-bridge radiotelephones and encourage international acceptance.

✓ Survey the radar target identification field looking toward an all-weather identification system.

✓ Study radar data computers to determine the extent to which they might increase safety and whether comparable results might be obtained with simpler, less expensive equipment or more extensive training.

✓ Collect and disseminate information on improved ship maintenance and repair and prevention of corrosion and fouling; develop methods to statistically analyze causes of ship accidents.

✓ Encourage chart updating improvements through aerial photography, horizontal sounding equipment and development of easier methods for chart revision.

✓ Carry out research aimed at removal of such environmental obstacles as rain and fog.

✓ Make use of system analyses to determine ship design, schedule construction and predict future shipping requirements.

✓ Encourage R&D in steam turbine and oil-fired gas turbine ships, eventually building comparative ships of advanced design.

✓ Encourage long-range hydrodynamic research in such areas as resistance, seaworthiness, new approaches to propulsion, maneuvering and control.

(continued)

* MARITIME RESEARCH AND DEVELOPMENT (continued)

✓ Encourage design studies, including a 45-knot passenger ship, a 30-knot unitized express cargo ship, an all-aluminum hull design and the use of plastic for deckhouses and superstructures.

✓ Long range studies of structures and materials, particularly for faster and more slender ships of the future which will pose questions of both loads and structural response.

✓ Study possible experimental application of new methods of energy conversion, such as fuel cells, thermionics and magnetohydrodynamics.

✓ Follow the development of nuclear power plants but delay any decisions on new ships until operating experience with the NS Savannah can be studied.

* UNUSUAL SHIP TYPES

Advisors to the National Academy of Sciences recommend against the expenditure by large sums for development of unusual ship types, stating "we do not feel that any of these concepts offer promise of solving the basic difficulties of the subsidized portions of the U. S. merchant marine within the forseeable future." They comment:

ø Commercial submarines are immune to speed losses in heavy weather and would be extremely valuable in certain types of emergency military situations. It is possible that future exploitation of Alaskan oil fields would make submarines worth consideration for the transport of oil to Northern Europe via the polar ice cap. Weighing heavily against these advantages are two important factors:

✓ Propulsion would almost certainly have to be nuclear which in itself is still well removed from commercial feasibility.

✓ Total horsepower requirements would exceed that of an equivalent surface ship except at unprofitably high speeds.

ø Hydrofoils are in use throughout the world as short-run passenger carrying vehicles. While slower than airplanes, they may offer the advantage of direct connections between business districts of two or more cities and are also well-suited to transportation between under-developed or mountainous land areas where airports are difficult to build. Hydrofoils are somewhat like aircraft in sensitivity to weight and are equally unsuited to economic transportation of large amounts of cargo. Long voyages are also precluded by the required quantities of fuel although the development of a truly lightweight nuclear plant would offer a solution. We do not feel that the hydrofoil can compete with passenger aircraft except under the special circumstances outlined above, nor do we believe that it can be extensively used for transportation of cargo.

ø Ground-effect vehicles are like hydrofoils in their sensitivity to weight. Most of the comments in the preceding paragraph would apply. Ground-effect vehicles are newer in concept than hydrofoils and are a decade or so behind in development. Chief advantages seem to lie in amphibious characteristics and independence of terminal facilities.

ø Plastic sack oil transport, under active development abroad, offers low first cost and efficient operation in the unloaded return voyage when the sack could be rolled up and carried aboard the tugboat. Chief difficulties seem to lie in short life of plastic materials, limitations on size arising from weakness of the material and safety considerations. Private industry can develop this.

(While limited supplies last, "Proposed Program for Maritime Administration Research" in two volumes, 360 pages, is available free on request to Publication Office, National Academy of Sciences, Washington 25, D. C.)

* ARMY RESEARCH AND DEVELOPMENT REQUIREMENTS

A secret security clearance is necessary for private industry to obtain a copy of a valuable new guide book that spells out problem areas in the development of Army weapons, ammunition, guided missiles and rockets, combat and support vehicles.

The volume, entitled "U. S. Army Research and Development Problems Guide" contains background information on each problem, and information on specific requirements and interested Army contact points.

Companies possessing a secret clearance who have qualified to participate in the Army Ordnance Qualitative Development Requirements Information (QDRI) Program may obtain copies through Ordnance District Offices located in Boston, Mass.; Philadelphia, Pa.; New York, N.Y.; Birmingham, Ala.; St. Louis, Mo.; Cincinnati, Ohio; Detroit, Mich.; Cleveland, Ohio; Chicago, Ill.; San Francisco, Calif. and Los Angeles, Calif. Copies are also available through Army Ordnance Arsenals and Commands.

Any civilian organization having an interest in such activity which is not participating in the QDRI program should contact one of the above offices. You may qualify to receive the Guide if you possess a suitable research and development capability, a secret security clearance, and if you complete a policy agreement.

* ARMY RESEARCH AND DEVELOPMENT POLICIES

Lt. General Arthur G. Trudeau has tightened his control of research and development projects by the Army's various technical services. As Chief of Research and Development he will now have increased authoritative direction and control of all Army R&D functions and installations used primarily for research and development.

* DOCUMENTATION RESEARCH PROPOSALS SOUGHT

National Science Foundation is seeking means to spend some $1 million on projects that "may" contribute to the general goal of improving the handling of scientific information. It will consider proposals for research projects or studies of "a fundamental or general nature," with emphasis on:

✓ Information Needs of the Scientific Community -- Studies or experiments to provide better understanding of scientific communication processes, scientists' information needs, and the extent to which needs are met by existing publications and information services, or could be met by proposed new types of publications and services.

✓ Information Storage and Retrieval -- Research on the systematization and mechanization of procedures for handling large volumes of scientific information, including procedures for automatic analysis of texts of documents, automatic indexing and abstracting, and automatic searching of stored materials; and tests and evaluations of existing, newly developed and proposed procedures for handling scientific information.

✓ Mechanical Translation -- New groups wishing to undertake research on mechanical translation procedures and related studies of language "should give first consideration to building upon and complementing the intensive work already accomplished by established groups."

(Direct inquiries and proposals to Documentation Research Program, National Science Foundation, Washington 25, D. C.)

* MISSILE RANGE INFORMATION

The Department of Defense has issued a new listing of U. S. missiles according to range. Despite a number of classified deletions the information released is published here for reference. All distances, unless otherwise noted, are in statute miles:

AIR FORCE

Falcon
- Gar I ..... Beyond 5
- Gar 2 ..... Beyond 5
- Gar 3 ..... Beyond 5
- Gar 4 ..... Beyond 5
- Gar 9 ..... N/R
- Gar 11 ..... N/R

Matador ..... Over 500
Mace ..... Over 600
Atlas ..... Over 6,325
Snark ..... Over 6,325
Thor ..... Over 1,650
Bomarc ..... A model over 200
..... B model over 400
Hound Dog ..... Over 500
Titan ..... Over 6,325
Minuteman ..... Over 6,325
Quail ..... N/R
Skybolt ..... Over 1,000
Genie 6

ARMY

Nike-Ajax 30
Nike Hercules ..... Over 85
Corporal 85
Redstone 250
Jupiter 1750
Lacrosse 20
Hawk ..... N/R
Nike Zeus ..... N/R
Sergeant 85
Pershing ..... N/R
Shillelagh ..... N/R
Redeye ..... N/R
Mauler ..... N/R
Honest John 15
Little John ..... N/R

* N/R ----- "Not Releasable"

NAVY

Bullpup ..... Over 15,000 feet
Regulus I 575
Sidewinder ..... N/R
Sparrow III ..... N/R
Talos ..... Over 75
Terrier ..... About 12
Asroc ..... N/R
Eagle ..... N/R
Polaris . 1400 to be increased to 1750
Sidewinder IC ..... N/R
Subroc ..... N/R
Tartar ..... Greater than 10
Typhon ..... N/R
Weapon Alfa ..... Variable
Hvar 1
Zuni 5
Cobra ..... 1,980 yards

* ANALOG-DIGITAL DIFFERENTIAL ANALYZER

Bureau of Naval Weapons, U. S. Navy, is sponsoring construction of breadboard models of a proposed analog-digital differential analyzer said to combine in one unit the analog advantages of high speed and continuous representation of variables with the digital capability for high precision and dynamic range.

The analyzer, developed at the National Bureau of Standards, represents dependent variables by two quantities -- a digital number representing the more significant part and an analog electrical voltage representing the less significant part. The Bureau's preliminary investigations indicate the proposed analyzer would be particularly applicable in simulating the dynamic problems in missile or aircraft design.

The models under construction will be used to further evaluate the system. They will contain two integrator and two multiplier units, each capable of receiving input voltages from other units. Digital registers and digital-to-analog converters will be constructed from transistorized digital packages, and the analog components from commercially available wide-band operational amplifiers.

RESEARCH CHECKLIST

- ISOSTATIC PRESS: The powder chamber of a 16-inch naval gun is being employed for the preparation of compressed charges of explosive materials by the Navy. The gun section, known as an isostatic press, is said to produce a cylindrical, ovoid or spherical charge of uniform density without cracks or cavities. In addition, the method is said to be safer, speedier and more efficient than techniques formerly used.

  (R&D by L. E. Starr & C. C. Misener, Chemical Engineering Division, Chemistry Research Department, Naval Ordnance Laboratory, White Oak, Silver Spring, Md.)

- FATIGUE-RESISTANT STEELS: Studies for the U. S. Army indicate superior fatigue properties for steels heat-treated to high tensile strengths that contained copper as an alloying element. The amount of copper in the alloy appears to be critical, the Army was advised, with 1.3 percent by weight giving optimum strength when low tempering temperatures have been employed. The study also showed that, with the exception of high-silicon steels, maximum strengths are obtained with specimens tempered at 350° or 400°F.

  (For further details write National Bureau of Standards, Office of Technical Information, Washington 25, D. C. regarding Fatigue Properties of Some High-Strength Steels.)

- AVIATION FUEL FILTER: Army Engineers will soon conduct field tests of a lightweight, portable filter-separator for removal of water and solid contaminants from aviation and jet fuel. The proposed unit will be used in conjunction with a standard barrel pump for fueling aircraft directly from 55 gallon drums in the field. Capacity, in filtered fuel, is expected to be 20 gallons per minute and the unit is expected to materially reduce engine failures.

  (Prototype fabricated by Fram Corporation, Warner Lewis Division, Tulsa, Oklahoma under contract with U. S. Army Engineer Research and Development Laboratories, Ft. Belvoir, Va.)

- HIGH TEMPERATURE RESISTOR: A one-watt resistor with a range of from 50 to at least 1,500 ohms has been developed through Air Force sponsored research. The device measures 3/8 inch in diameter by one inch in length and is made by using carbon alloy resistance films deposited on high alumina substrates protected by a reducing atmosphere.

  (Developmental Report of Feb. 1960 now available. 57 pages. $1.50. Write OTS, U. S. Department of Commerce, Washington 25, D. C. for PB 161 688.)

- NATURAL GAS FOR BLAST FURNACES: The U. S. Bureau of Mines has found that unusually high temperatures can be used effectively in a blast furnace when natural gas is introduced. The method does not affect the smooth operation of the furnace and permits a substantial increase in production rates.

  (Report Available. 15 pages. Single Copies Free. Write Publication Distribution Section, U. S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, Pa. for Report of Investigation No. 5621.)

PUBLICATION CHECKLIST

- ☐ HYDROFOILS, a comprehensive study made by Grumman Aircraft and an affiliate to determine the type of hydrofoil craft best suited to future express cargo and passenger applications -- and to establish design criteria. Includes studies of foil section and arrangement, appendages, weights, power plants and propulsive devices and hull design. Note: A summary of this study was published last year by the Maritime Administration. 400 pages. $6. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for "Study of Hydrofoil Seacraft".)

- ☐ SHOCK TUBES, a new section of the Defense Department's Handbook of Supersonic Aerodynamics, presenting a comprehensive account of shock tube theory and application. Dated 1959 and published in 1960. 604 pages. $3.75. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication D 215.7:1488/v.6 sec 18.)

- ☐ AIRFRAME MAINTENANCE AND REPAIR, an Air Force training guide which includes information on aircraft metals, blueprint reading and shop drawings, forming processes, rivets and riveting, fasteners, aircraft plastic fabrication and repair, sandwich construction and other topics related to structural maintenance and repair. 332 pages. $2.50. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication D 217.2 Ae 8.)

- ☐ MILITARY AIR TRANSPORTATION, the full text, now available, of May 1960 Congressional hearings on this controversial subject. Includes the text of the Department of Defense Report to the President on the Role of the Military Air Transport Service (MATS) in Peace and War. 237 pages. Single Copies Free. (Write Committee on Government Operations, U. S. House of Representatives, Washington 25, D. C. for Hearings - MATS.)

- ☐ ORGANIZATION AND MANAGEMENT OF MISSILE PROGRAMS, the text of hearings before a Congressional subcommittee, with particular emphasis on arrangements between the Air Force and Space Technology Laboratories and the newly formed Aerospace Corporation. 228 pages. Single Copies Free. (Write Committee on Government Operations, U. S. House of Representatives, Washington 25, D. C. for Organization and Management of Missile Programs, Parts I, II and III.)

- ☐ NUCLEAR ENERGY FOR GASIFYING COAL, a Bureau of Mines conceptual study of a system to utilize nuclear heat for coal gasification. Includes information on apparatus built to simulate operation of a high-temperature nuclear system. 11 pages. 15 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Information Circular 7965.)

- ☐ RADIOACTIVE WASTE DISPOSAL, the first of two volumes of the proceedings of a scientific conference at Monaco during November, 1959. Covers such topics as the nature of Radioactive wastes, treatment and processing. Papers are reproduced in language of their presentation and English, with abstracts in English, French, Russian and Spanish. 604 pages. $6. (Write Publications Sales Unit, International Atomic Energy Agency, Kaerntnerring 11, Vienna I, Austria.)

- ☐ CALIBRATION OF LINE STANDARDS, an outline of methods used by the National Bureau of Standards for the calibration of line standards of length and measuring tapes. 12 pages. 15 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for NBS Monograph 15.)